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Whales: new data from 1980-2014

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INTERNATIONAL  
WHALING COMMISSION

# Photo-identification of Antarctic Blue Whales: new data from 1980-2014.

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## ABSTRACT

Two collections of identification photographs of individual Antarctic blue whales were compared to the images of 416 individuals in the Antarctic Blue Whale Catalogue. The collections include 1) personal photographs collected during IWC IDCR/SOWER cruises 1980/81-2004/05 and 2) photographs obtained during the South African Antarctic Blue Whale Survey 2013/14. Twenty-five new individual blue whales were identified: nine from the personal photographs and sixteen from the South African survey. There were no matches between collections or to the Antarctic Catalogue. Twenty-five new individuals brings the total number of identified Antarctic blue whales to 441, represented by 336 left sides and 321 right sides. This is 15-19% of the most recent accepted estimate of abundance of 2,280 in 1997/1998 (CV=0.36; Branch, 2007). Notably there were no matches to IWC Management Area III by the South African photos, which were all from Area III, even though 45% of the Antarctic catalogue contains photos from Area III. The collection of Antarctic blue whale identification photographs provide data for capture-recapture estimates of abundance as well as information on the movement of individual blue whales within the Antarctic region.

KEYWORDS: ANTARCTIC, SOUTHERN OCEAN, PHOTO-ID, MOVEMENT

## INTRODUCTION

The population status of the endangered Antarctic blue whale (*Balaenoptera musculus intermedia*) is of interest to the IWC Scientific Committee and is the focus of the IWC-SORP Antarctic Blue Whale Project. The Project aims to broaden the knowledge of the conservation status of Antarctic blue whales, by conducting research toward providing an updated circumpolar abundance estimate, by improving understanding of population structure, and by discovering linkages between feeding and breeding grounds (Bell, 2016). The use of photo-identification data in a capture-recapture analysis for the production of a contemporary (new) estimate of abundance of Antarctic blue whales is a component of the Antarctic Blue Whale Project (Bell, 2012).

The Antarctic Blue Whale Catalogue was established in 2007; photographs from the IWC/SOWER cruises, obtained from Areas I-VI, formed the foundation of the catalogue (Olson, 2010). Over the years the number of photo-identified Antarctic blue whales has increased, with photographs collected during voyages conducted under IWC-SORP in 2013 and 2015 in Area V (Double *et al.*, 2013; Double *et al.*, 2015), with photographs from the Institute of Cetacean Research, Japan, from its whale research in Areas III-VI (Matsuoka and Pastene, 2009; Olson *et al.*, 2013, Olson *et al.*, 2014, Olson *et al.* 2016), and with opportunistic photographs contributed by scientists working on other projects in the Antarctic (Olson *et al.* 2016).

As of 2016, the catalogue contained the sighting histories of 416 individual blue whales in the circumpolar Antarctic (Olson *et al.* 2016).<sup>1</sup> The photo-identification data from this catalogue have produced information on inter-annual whale movement (Olson *et al.*, 2016), within season sighting rates (Olson *et al.*, 2016), and was the basis for a pilot capture-recapture study (Olson and Kinzey, in press).

Recently, new photographs of Antarctic blue whales became available from two sources: the South African Antarctic Blue Whale Survey 2013/14 (Findlay *et al.*, 2014) and from the personal files of Paul Ensor (Cruise Leader, IWC/SOWER). This study identified and compared individual identification photographs of Antarctic blue whales from the new collections to the existing catalogue (of 416 individuals).

## **METHODS**

An assortment of 167 Antarctic blue whale photographs were collected by one of us (PE) on a personal camera during ten IWC IDCR/SOWER cruises, 1980/81 through 2004/05. All photos were in slide format and digitized before analysis. The South African Antarctic Blue Whale Survey collected 3,150 blue whale photographs during its cruise in 2013/14 (Findlay *et al.*, 2014). All photographs were judged to meet minimum criteria of quality based on distance to the subject (whale), angle, exposure, and focus. Only photos containing a whale's dorsal fin were used for identification, as the fin is necessary for comparison to the identification photos in the Antarctic catalogue as well as other photo collections. Whales were examined for unique natural markings and identified as individuals following methods outlined in Sears *et al.* (1990) and Gendron and Ugalde de la Cruz (2012).

Photographs of identified individuals from both collections of photographs were compared to one another and to the Antarctic Blue Whale Catalogue.

## **RESULTS AND DISCUSSION**

After comparison to the catalogue, the photographs in Ensor's collection yielded 10 ID's: 9 newly identified blue whales and 1 previously identified blue whale (Table 1). This was not a re-sight; Ensor's photo was taken at the same time as the identification photo already in the catalogue. The new ID photos were collected in 5 of the 6 IWC Management Areas (all but Area II).

Sixteen individual blue whales were identified from photographs collected during the 2013/14 South African Antarctic Blue Whale Survey conducted in IWC Management Area III (Table 1). This included 13 left side and 11 right side photos. One whale was re-sighted after a 3-day interval. There were no matches to the Antarctic Blue Whale Catalogue, so all 16 individuals became new Antarctic ID's. There were no matches between SAABWS and Ensor.

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<sup>1</sup> The catalogue is maintained at the Southwest Fisheries Science Center (SWFSC), USA. Photos and data are archived on three hard drives and a SWFSC institutional server.

Table 1. Number individual Antarctic blue whales identified from Ensor's photo collection and from the South African Antarctic Blue Whale Survey (SAABWS).

Year	IWC Area	No. of photos	No. left side ID's	No. right side ID's	Total no. identified blue whales	Comments
<b>ENSOR</b>						
1980/1981	V	11	1	1	2	
1984/1985	IV	7	1	0	1	
1987/1988	III	20	1	1	1	
1988/1989	Australia <sup>a</sup>	14	0	0	0	<sup>a</sup> Pygmy blue whales
1989/1990	I	11	1	1	1	
1993/1994	I	7	0	0	0	
1994/1995	IIE/IVW	45	3	1	4	
1995/1996	VI	17	0	0	0	
1998/1999	IV	23	1	0	1 <sup>b</sup>	<sup>b</sup> Previously ID'd whale #9901
2004/2005	III	12	0	0	0	
<b>ENSOR TOTAL</b>		167	8	4	10	
<b>SAABWS</b>						
2014	III	3,150 <sup>2</sup>	13	11	16	
<b>GRAND TOTAL</b>			21	15	26	

The total of 25 new ID's from these two photo collections brings the total number of photo-identified Antarctic blue whales up to 441 whales, represented by 336 left sides and 321 right sides. The minimum (321) and maximum (441) number of unique individuals represents 15% and 19%, respectively, of the most recent accepted estimate of abundance of Antarctic blue whales, 2,280 in 1997/98 (Branch, 2007). To date, a relatively small number of whales have been re-sighted inter-annually: 3% (14/441). There is evidence that the Antarctic blue whale population has been increasing (Branch, 2007) which would explain the low re-sighting rate.

The photographs from the 1980's and 1990's are a valuable contribution to the catalogue; a future recapture of any of the identified whales from these decades would improve the estimate of survival in an abundance model. To date the longest recapture interval is 12 years, 1995-2007 (Olson *et al.*, 2016).

<sup>2</sup> Reported in Findlay *et al.*, 2014.

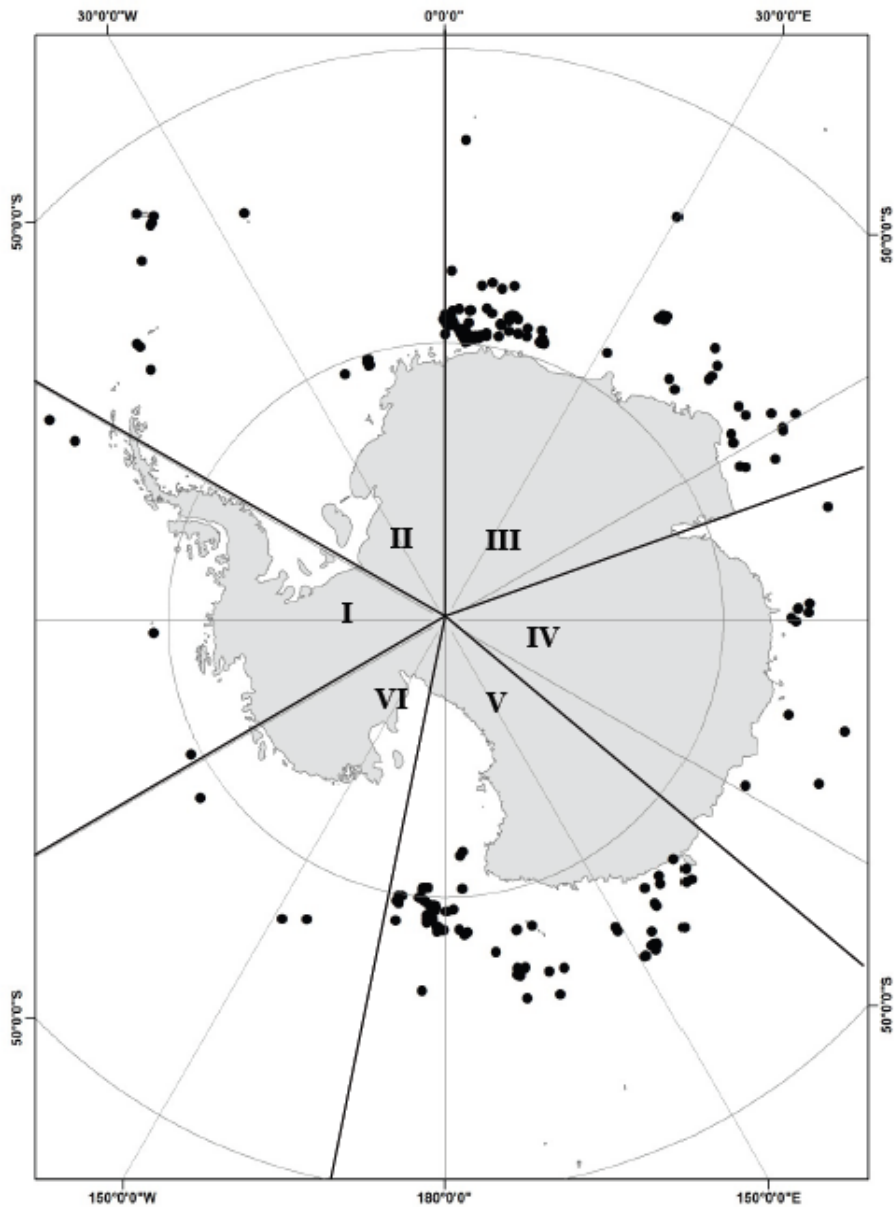


Figure 1. The distribution of photo-identified Antarctic blue whales, 1980-2016.

### Area III

Notable in the present study is that there were no re-sighted whales among the 16 whales photographed in Area III by the South African survey in 2013/14. Area III has the largest proportion in the Catalogue (of the six Areas) with 184/416 individuals in 2016 (Figure 1). There were a high number of blue whale sightings in Area III during the IWC/SOWER years 2004/05, 2005/06, and 2006/07 (Ensor *et al.* 2005, 2006, 2007) resulting in a substantial number of photographs. The 16 identifications from the South African survey brings the total number of identified whales in Area III up to 200, and 45% of the catalogue total. Eight of the fourteen whales re-sighted inter-annually have been seen in Area III (Figure 2), including the whale mentioned above with the 12-year sighting interval. Blue whales in Area III exhibit both small and large inter-annual movements. Generally, it is still not known if Antarctic blue whales show site tenacity for feeding areas or if they simply forage widely and randomly.

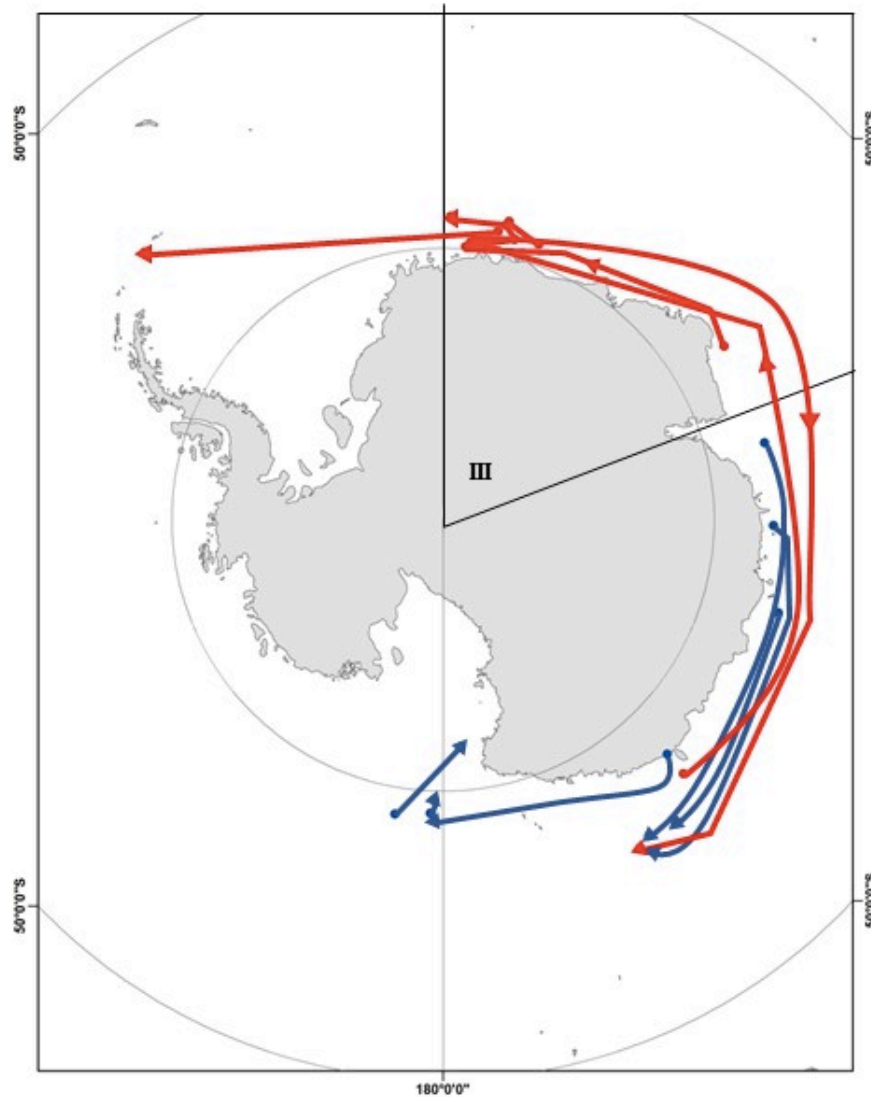


Figure 2. The locations of Antarctic blue whales re-sighted inter-annually. The red arrows indicate whales sighted and/or re-sighted in Area III; blue arrows represent whales sighted/re-sighted in other Areas. The arrows represent minimum movements between locations and not actual whale movements.

### Conclusion

A cornerstone of the Antarctic Blue Whale Project is to generate new estimates of abundance and utilizing photo-ID data for capture-recapture analysis (Bell, 2012; Peel *et al.*, 2015). The most recent accepted estimate of abundance (Branch, 2007) is based on line-transect data now over 19 years old. The continued collection of identification photographs from the Antarctic will provide data toward a set eventually large enough to obtain new estimates of abundance. This subpopulation of blue whales remains on the IUCN Red List as Critically Endangered.

More data are needed to fully understand the movements of Antarctic blue whales between and within seasons, especially with the major climate changes taking place in the Antarctic. The continued collection and analysis of photographs from the Antarctic, along with other research methods, will yield more information on these patterns and will contribute to the understanding of blue whale population structure in the Southern Hemisphere.

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